



Integumentary System

Explore

Essential Question: What are the parts and functions of the integumentary system?

Parts of the Human Integumentary System

When one is asked to list the major organs of the human body, skin is often forgotten. However, skin is more than just a major organ—it is the largest human organ. The visible surface of skin is just one layer of a fairly complex system. Perhaps the best way to understand the parts of the skin is to literally go “skin deep.”

The outer layer of skin that is exposed to the environment is called the epidermis. The top of the epidermis is comprised of a layer of dead skin cells. Beneath them are layers of living cells. As the living cells grow, divide, and eventually die, they are pushed to the surface of the epidermis. Together, these dead cells form a tough, yet flexible, waterproof covering. The dead cells are sloughed off periodically during exfoliation. Showering, scratching an itch, or brushing up against a surface are just a few ways in which skin is exfoliated. The layer of dead skin cells is completely shed and replaced once every four to six weeks.

Below the epidermis is the dermis. The dermis contains blood vessels, nerves, sensory receptors, glands, smooth muscle, hair follicles, and the protein collagen. This layer of the integumentary system interacts with other systems of the body to maintain homeostasis. Specialized glands in the dermis called sebaceous glands secrete sebum. Sebum is an oily substance that helps waterproof skin along with maintaining its softness and flexibility. Sebum can also kill bacteria on the surface of the skin. However, the production of too much sebum can lead to clogged pores and acne breakouts in humans.

Within the dermis are pockets of epidermal cells called follicles that produce hair. Follicles are in close contact with the sebaceous glands. The rate of cell growth at the bottom of a hair follicle determines the length of the hair. Hair, itself, is made of the protein keratin. In humans, hair covers and protects nearly every part of the skin. Hair on the head protects the skin from ultraviolet radiation, and hair within the nose and ears and hair around the eyes (eyebrows and eyelashes) helps to prevent particles from entering the body.

Beneath the dermis is the hypodermis. This subcutaneous layer is made up mostly of fat cells and loose connective tissue. It helps keep the body warm and absorbs shocks.

Nails are also a component of the human integumentary system. They grow out of a nail root, or matrix, which is located on the ends of fingers and toes. Like hair, nails are mostly made from tough, fibrous keratin. Fingernails grow about 36 millimeters (1.4 inches) per year, which is three to four times faster

than toenails. Certain conditions may cause nails to grow faster or slower. For example, due to changes in hormones, pregnant women tend to have fast-growing nails. In contrast, people with illnesses may experience slow nail growth.

Some animals have feathers, scales, horns, hooves, and quills. These features are part of the integumentary system as well. Like hair and nails, they are mostly made up of keratin proteins. Antlers, which may be mistaken for horns, are not composed of keratin. Rather they are bony tissue, and they are shed each year. Horns are composed of keratin that surrounds a bony center.

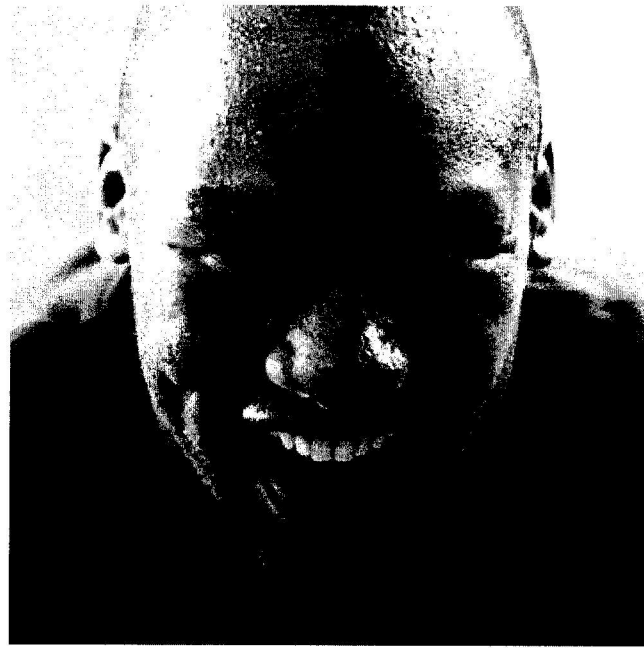
Functions of the Integumentary System

The most important function of skin is protection. Skin is the first line of defense against foreign pathogens. By providing a barrier between inner organs and the external environment, most pathogens and particles of debris are blocked from entering the body. Even inside the nostrils, where many pathogens enter, hairs covered in mucus catch dust and microscopic invaders before they can enter the body and cause infection. Skin also helps shield the body from the sun's ultraviolet radiation and prevents the body from drying out. Nails protect the tips of fingers and toes.

Other important functions of the integumentary system include thermoregulation, gathering sensory information, and producing vitamin D. Sweating serves two purposes. It releases small amounts of waste products through the skin and helps regulate body temperature.

Sweat is composed mostly of water, but it also contains urea, ammonia, salts, and other wastes that must be excreted from the body.

The main function of sweating is thermoregulation—controlling body temperature. Sweat cools the body down. After vigorous activity, or on a hot day, body temperature rises and triggers the production of sweat. Once it is released to the skin's surface, sweat begins to evaporate into the surrounding atmosphere. When water evaporates, it changes from a liquid to a vapor. This change of state from a liquid to a gas requires energy. As the sweat evaporates heat is transferred from the body to the atmosphere. This loss of heat lowers body temperature.



Releasing sweat is one way the body cools its core body temperature.

The skin regulates body temperature in other ways. When body temperature rises, blood vessels in the dermis expand or dilate, drawing more blood closer to the surface of the skin. Greater amounts of heat are released from the body when blood vessels dilate, reducing core body temperature. The opposite occurs when heat needs to be conserved by the body. Blood vessels contract, and blood is drawn away from the surface of the skin in order to conserve heat. Goosebumps along the skin's surface also arise when the body responds to drops in its temperature. Cold stimulates tiny muscles around the hair follicles to contract. The contraction closes the follicle which causes the hair to stand on end. The vertical hairs reduce airflow around the body and trap warm air close to the skin.

The integumentary system works with the nervous system to gather information about the surrounding environment and send it to the brain. Sensory receptors in the skin detect stimuli such as pressure, temperature, and pain. For example, when a person touches a hot surface with a finger, a quick electrical signal is sent from receptors in the skin through the nervous system. A message is quickly sent back, signaling the hand to move away from the hot stimulus. This is called a reflex action.

Another important function of skin is to produce vitamin D, which is used to help absorb calcium and phosphorous compounds in the small intestine during digestion. When sunlight interacts with skin cells, a chemical reaction occurs that results in the production of vitamin D.

The functions of the integumentary system are vital to overall health. Keeping skin healthy by eating a balanced diet, maintaining a cleaning regimen, managing stress, and limiting exposure to the sun's ultraviolet radiation is essential. These steps will help ensure that the skin continues to function properly for a long time.